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CRANK SHEAR WITH TWO PAIRS OF BLADES FOR  
CUTTING ROLLED STRIP

The invention concerns a crank shear, especially for cutting rolled strip, which comprises two pairs of blades that can be mounted on blade holders, wherein the blade holders are supported opposite each other in a vertical plane in a pair of eccentric drive shafts and are pivoted on torque supporting levers in double-joint mechanisms in interaction with hydraulic control units that act on these double-joint mechanisms.

Widely used crank shears have the disadvantage that they have only one pair of blades, usually with a convex cutting edge. Rotary shears used for the same application are known from the prior art, which have two pairs of blades, each of which has one convex and one concave cutting edge. In this regard, to achieve the ability to have a greater influence on the strip ends, the leading end of the strip is cut, for example, with a convex blade cutting edge, while the tail end of the strip is cut with a concave blade cutting edge.

The document EP 0 075 448 describes a crank shear with two pairs of blades which are supported opposite each other in a vertical plane in a pair of eccentric drive shafts and are pivoted on torque supporting levers in double-joint mechanisms with at least one hydraulic control unit that acts on these double-joint mechanisms.

The previously known shear for cutting metal strip has two blade holders, which can be rotated relative to each other, so that the blades can be alternately brought by their two blade holders into cutting positions with the metal strip. Each blade holder has a mounting for two blades and can be moved between two positions, in which the corresponding blades can each be brought into an operating position.

With this arrangement, one pair of blades at a time can be sharpened, while the other pair is used for cutting, and then both pairs can possibly be exchanged for one another.

A disadvantage of the previously known crank shear with two pairs of blades is the passage position of extremely small width that can be occupied between the pairs of blades, which, for example, during the passage of an upwardly bent leading end of a strip, can result in collision with the shear. A disruption of this type costs operating time and material. Another difficulty

with the previously known shear is that the blades cannot be mounted in the blade holders with the provenly effective blade guard clamp.

Proceeding on the basis of the aforementioned prior art, the objective of the invention is to specify a design of the crank shear with two pairs of blades that avoids the aforementioned problems and disadvantages and, in particular, allows a significantly wider passage position for the rolled strip and also allows the use of the proven blade guard clamp without any difficulties.

To achieve this objective in a crank shear of the type specified in the introductory clause of Claim 1, the invention proposes that the blade holders form axially parallel pairs of bearing surfaces for the pairs of blades on approximately radial projections, with the upper pair of blades arranged on inner, oppositely oriented bearing surfaces of a curved recess of the upper blade holder, and with the lower pair of blades arranged on the outer bearing surfaces of a relatively narrow projection oriented towards the recess.

In this regard, one embodiment of the invention provides that, in a spread position of the torque supporting levers of approximately  $90^\circ$  and at the shortest separation of the

eccentric shafts and a running direction of the rolled strip towards the supporting levers, a position of the pair of blades is reached for the cropping cut at the leading end of the strip, in which the hydraulic control unit on the upper supporting lever of the double-joint mechanism is fully extended, and the control unit on the lower supporting lever of the double-joint mechanism is fully retracted.

In addition, one embodiment of the design of the crank shear of the invention provides that, in a spread position of the torque supporting levers of approximately  $90^\circ$  and at the greatest separation of the eccentric shafts and a running direction of the rolled strip towards the supporting levers, a passage position of the crank shear is reached, in which the control unit on the lower supporting lever of the double-joint mechanism is fully retracted for folding the lower supporting lever, and the control unit on the upper supporting lever of the double-joint mechanism is fully extended.

Furthermore, the invention provides that in an approximately horizontal parallel position of the torque supporting levers opposite the running direction of the rolled strip and at the shortest separation of the eccentric shafts, and with the upper and lower double-joint mechanism extended

approximately linearly, a position of the rear pair of blades for cutting the tail end of the strip is reached, in which the hydraulic control unit on the upper supporting lever of the double-joint mechanism is fully retracted, and the control unit on the lower supporting lever of the double-joint mechanism is fully extended.

Finally, the design of the invention provides that in a position of the upper supporting lever that is downwardly inclined towards the rolled strip with the upper hydraulic control unit retracted, and in a position of the lower supporting lever that is upwardly inclined towards the rolled strip with the lower control unit of the double-joint mechanisms fully extended, and with the greatest separation of the eccentric shafts, a passage position through the shear is reached (Figure 4).

Additional details, features, and advantages of the invention are apparent from the following explanation of the specific embodiment of the invention that is schematically illustrated in the drawings.

-- Figure 1 shows a side view of the crank shear with two blade holders and blades mounted on them in an operating phase during the cropping of the leading end of a rolled strip.

-- Figure 2 shows the crank shear in its extremely wide-open position for the passage of the rolled strip.

-- Figure 3 shows the crank shear, likewise in a side view, in a position for cropping the tail end of the strip.

-- Figure 4 shows the crank shear in its open position for another passage of the rolled strip following the cropping of the tail end of the strip.

Figure 1 shows the crank shear with two pairs of blades 3, 4, which can be mounted on blade holders 1, 2, wherein the blade holders 1, 2 are supported opposite each other in a vertical plane (x-x) in a pair of eccentric drive shafts 5, 6 and are pivoted on torque supporting levers 7, 8 in double-joint mechanisms 9, 10 and interact with hydraulic control units 11, 12 that act on these double-joint mechanisms.

The blade holders 1, 2 form axially parallel pairs of bearing surfaces 16 to 18 for the pairs of blades 3, 4 on approximately radial projections 13 to 15, with the upper pair of blades 3 arranged on inner, oppositely oriented bearing surfaces 16, 17 of a curved recess 20 of the upper blade holder 1, and with the lower pair of blades 4 arranged on the outer bearing surfaces 18 of a relatively narrow projection 15 oriented towards the recess 20.

In a spread position of the torque supporting levers 7, 8 of approximately  $90^\circ$  and at the shortest separation D of the eccentric shafts 5, 6 and a running direction 21 of the rolled strip 22, the crank shear has reached a position of the pair of blades 3 for the cropping cut at the leading end 23 of the strip. In this position, the hydraulic control unit 11 on the upper supporting lever 7 of the double-joint mechanism 9 is fully extended to spread the supporting lever 7, and the control unit 12 on the lower supporting lever 8 of the double-joint mechanism 10 is fully retracted. Reference number 19 identifies the roller table for conveying the rolled strip 22.

Figure 2 shows a wide passage position of the crank shear for the rolled strip in an extreme spread position of the torque supporting levers 7, 8 of approximately  $90^\circ$  at the greatest separation d of the eccentric shafts 5, 6 and with a running direction 21 of the rolled strip 22 towards the supporting levers 7, 8. In this position, the control unit 12 on the lower supporting lever 8 of the double-joint mechanism 10 is fully retracted for its folding the lower supporting lever 8, and the control unit 11 on the upper supporting lever 7 of the double-joint mechanism 9 is fully extended.

Figure 3 shows the crank shear with an approximately

horizontal parallel position of the torque supporting levers 7, 8 opposite the running direction 21 of the rolled strip 22 and at the shortest separation D of the eccentric shafts 5, 6, and with the upper double-joint mechanism 9 and lower double-joint mechanism 10 extended approximately linearly. A position of the rear pair of blades for cutting the tail end 24 of the strip is reached here. In this position, the hydraulic control unit 11 on the upper supporting lever 7 of the double-joint mechanism 9 is fully retracted, and the control unit 12 on the lower supporting lever 8 of the double-joint mechanism 10 is fully extended.

Finally, Figure 4 shows a passage position through the shear with the eccentric shafts 5, 6 at their greatest separation. Here the upper hydraulic control unit 11 of the upper double-joint mechanism 9 is fully retracted in a position of the upper supporting lever 7 that is downwardly inclined, while the lower control unit 12 of the lower double-joint mechanism 10 is fully retracted.



List of Reference Numbers

1. blade holder
2. blade holder
3. blade
4. blade
5. eccentric drive shaft
6. eccentric drive shaft
7. torque supporting lever
8. torque supporting lever
9. double-joint mechanism
10. double-joint mechanism
11. hydraulic control unit
12. hydraulic control unit
13. projection
14. projection
15. projection
16. inner bearing surface
17. inner bearing surface
18. outer bearing surface

19. roller table
20. curved recess
21. running direction
22. strip/rolled strip
23. leading end of strip
24. tail end of strip
25. stop
26. stop
27. stop
28. stop

## CLAIMS

1. Crank shear, especially for cutting rolled strip (22), which comprises two pairs of blades (3, 4) that can be mounted on blade holders (1, 2), wherein the blade holders (1, 2) are supported opposite each other in a vertical plane (x-x) in a pair of eccentric drive shafts (5, 6) and are pivoted on torque supporting levers (7, 8) in double-joint mechanisms (9, 10) in interaction with hydraulic control units (11, 12) that act on these double-joint mechanisms (9, 10), characterized by the fact that the blade holders (1, 2) form axially parallel pairs of bearing surfaces (16-19) for the pairs of blades (3, 4) on approximately radial projections (13-15), with the upper pair of blades (3) arranged on inner, oppositely oriented bearing surfaces (16, 17) of a curved recess (20) of the upper blade holder (1), and with the lower pair of blades (4) arranged on the outer bearing surfaces (19, 18) of a relatively narrow projection (15) oriented towards the recess (20).

2. Crank shear in accordance with Claim 1, characterized by the fact that in a spread position of the torque supporting levers (7, 8) of approximately 90° and at the shortest separation (D) of the eccentric shafts (5, 6) and a running direction (21) of the rolled strip (22) towards the supporting

levers (7, 8), a position of the pair of blades (3) for the cropping cut at the leading end (23) of the strip is reached, in which the hydraulic control unit (11) on the upper supporting lever (7) of the double-joint mechanism (9) is fully extended, and the control unit (12) on the lower supporting lever (8) of the double-joint mechanism (10) is fully retracted (Figure 1).

3. Crank shear in accordance with Claim 1, characterized by the fact that in a spread position of the torque supporting levers (7, 8) of approximately  $90^\circ$  and at the greatest separation (d) of the eccentric shafts (5, 6) and a running direction (21) of the rolled strip (22) towards the supporting levers (7, 8), a passage position of the crank shear is reached, in which the control unit (12) on the lower supporting lever (8) of the double-joint mechanism (10) is fully retracted, and the control unit (11) on the upper supporting lever (7) of the double-joint mechanism (9) is fully extended (Figure 2).

4. Crank shear in accordance with Claim 1, characterized by the fact that in an approximately horizontal parallel position of the torque supporting levers (7, 8) opposite the running direction (21) of the rolled strip (22) and at the shortest separation (D) of the eccentric shafts (5, 6), and with the upper double-joint mechanism (9) and lower double-joint

mechanism (10) extended approximately linearly, a position of the rear pair of blades for cutting the tail end (24) of the strip is reached, in which the hydraulic control unit (11) on the upper supporting lever (7) of the double-joint mechanism (9) is fully retracted, and the control unit (12) on the lower supporting lever (8) of the double-joint mechanism (10) is fully extended (Figure 3).

5. Crank shear in accordance with Claim 1, characterized by the fact that in a position of the upper supporting lever (7) that is downwardly inclined towards the rolled strip (22) with the upper hydraulic control unit (11) of the double-joint mechanism (9) retracted, and in a position of the lower supporting lever (8) that is upwardly inclined towards the rolled strip (22) with the lower control unit (12) of the double-joint mechanism (10) fully extended, and with the greatest separation (d) of the eccentric shafts (5, 6), the passage position through the shear is reached (Figure 4).